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Free word association testing with 224 college students showed that the free word association patterns produced by adults to relatively unfamiliar adjective stimuli tended to be similar to the association patterns given by young children to common adjectives. Adult responses to familiar adjectives were essentially the same as older children's responses to the same stimuli. Results were interpreted as supporting the view that previously reported patterns of associations of young children are principally due to the child's unfamiliarity with the stimulus word rather than his immature cognitive processes. [Not available in hard copy due to marginal legibility of original document.] (Author/KW)

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A Research and Training Program in Selected Aspects of Lexical and Syntactic Development in the Mentally Retarded

The Production of "Child-like" Word Associations by Adults to Unfamiliar Adjectives

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Abstract

The free word association patterns produced by adults to relatively unfamiliar adjective stimuli tend to be similar to the association patterns given by young children to common adjectives. Adult responses to familiar adjectives were essentially the same as older children's responses to the same stimuli. The results are interpreted as supporting the view that previously reported patterns of associations of young children are principally due to the child's unfamiliarity with the stimulus word rather than his immature cognitive processes.

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The Production of "Child-like" Word Associations by Adults to Unfamiliar Adjectives[1]

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During the last several decades, hundreds of studies have been reported which involve the Free Word Association Task (FWAT), and a substantial proportion of these have used children as subjects (Ss). Cramer (1968, Chapter 6) summarizes many of the developmental findings, indicating that the typical reponses obtained from children appear to change in rather regular ways as a function of age. Curiously enough, however, while many investigators have written extensive descriptive accounts of these shifts, relatively few have offered tentative explanations for why they occur--especially in terms of general underlying cognitive and/or psycholinguistic variables. Perhaps one of the most basic questions relative to explaining such developmental shifts could be phrased as follows: To what extent are the observed shifts due to general maturation of the child's cognitive information processing abilities, and to what extent are they due simply to the fact that the child is greatly increasing his knowledge of language during this time?

It is clear that in normal children, in the age range primarily involved (approximately 4 to 10 years), both general cognitive skills and knowledge of words and their meanings are developing dramatically, and thus, attempts to isolate the effects of one or the other factor are relatively difficult. The present paper will concentrate on evaluating the effect of the acquisition of word meanings on performance on the FWAT. If young children respond the way they

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do primarily because they are reltively unfamiliar with the stimulus words (and perhaps with the responses they give as well)--rather than because their cognitive processes are immature--then one might be able to obtain child-like patterns of responses from mature individuals to stimulus words with which they are relatively unfamiliar.

Developmental Shifts in FWAT responses

Stimulus Commonality. Perhaps the most obvious shift in FWAT responding as a function of age is the emergence of a few very frequent responses to a given stimulus word and the concomitant reduction in the total number of different responses. "Stimulus commonality" is the usual label given to measures of response agreement within a group of Ss; and responses of young children are characterized by low commonality--little agreement--while most older children and adults tend to give one of a relatively small number of popular responses to a given stimulus. Applying this phenomenon to the present study, unfamiliar stimulus words (given to adults) should yield distributions of responses with low commonality, while familiar stimulus words would yield the usual high commonality response distributions.

Cramer(1968) summarizes a number of studies on adults which could be considered as at least tangentially related to the above hypothesis. She concludes that, in adults, (a) the number of different responses to a stimulus is inversely related to the frequency of the stimulus and (b) that the relative frequency of the primary (most popular) response is directly related to the frequency of the stimulus; although both effects appear to be much weaker and more qualified than similar effects observed in children as a function of age instead of familiarity. Thus, the above predictions have some degree of support from previous studies as well as following from the present rationale.

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Syntactic-Paradigmatic Shift. Entwisle, Forsyth, and Muuss (1964) and Ervin (1961) have reported that the relationship between the form class of the stimulus word and the form class of the response word shows regular changes with increasing age. In particular, they have observed that young children tend to give a preponderance of responses belonging to a different form class than the stimulus, whereas older children give more responses which are members of the same form class as the stimulus. The former responses are called "syntactic" because Ervin and others have hypothesized that they result from the sequential, syntactic processes a child uses in producing ordinary sentences. Responses of the same form class as the stimulus are called "paradigmatic" because the members of any given form class supposedly can replace one another in a wide variety of sentence contexts. The extensive developmental data reported by Entwisle (1966) showed that, especially for adjective and verb stimuli, the proportion of same-form-class responses was much higher among children 8 to 10 years old than among children 7 years and younger. Thus, the prediction for the present study would be that unfamiliar stimulus words should yield more syntactic responses, while familiar stimuli should yield more paradigmatic responses. This effect was in fact demonstrated in a study by Deese (1962), but only for adjective stimuli. Using Thorndike-Lorge (1944) frequency as a measure of stimulus familiarity, he found that college students gave more syntactic responses to frequent adjectives; however, he found no similar effect for either verbs or nouns.

The Distant-to-Logical Shift. Moran and his associates (e.g., Moran, 1966; Moran, Mefferd, and Kimble, 1964; Moran and Swartz, 1970; Swartz and Moran, 1968; and Sullivan and Moran,1967)have categorized the relationships between stimuli and responses not on

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the basis of their form class memberships, but on the apparent semantic relationship existing between the two words. Their categories include synonym, coordinate, contrast, superordinate, predication, and functional relations. Their developmental findings show substantial and regular increases with age in synonym, coordinate, contrast, and superordinate responses, while predicate and functional responses remain approximately constant in their relative frequencies. Stolz and Seitz (1971) have labeled these first four response-types as "logical" responses, since they all involve implicit use of set (categorization) operations on the part of the subject (S). In their analysis of FWAT data collected from both retarded and normal youngsters, Stolz and Seitz also categorized responses into a variety of possible syntactic relationships and into an "unscored" or distant category. Corresponding to a regular increase in the proportion of logical responses--with increasing age--they found a marked decrease in these distant or unscored responses. This appeared for nouns as well as adjectives; however, only for adjectives was there any evidence of a syntactic stage of responding--occurring as an intermediate stage between the distant and the logical stages. Thus, they concluded that the basic developmental shift was from distant to logical associates. They pointed out that such an hypothesis does not deny the syntactic-paradigmatic shift phenomenon as described in the literature, since nearly all logical associates are paradigmatic while most distant responses appear to be novae (as originally observed by Entwisle, 1966). Such distant nouns would be classified as syntactic for adjective and verb stimuli but paradigmatic for noun stimuli, and it is worth noting that no investigator has reported any particularly strong evidence for a syntactic-paradigmatic shift among noun stimuli. Applied to the present study, then, unfamiliar words would be expected to elicit relatively few logical responses and many distant responses. Also, if the stimulus set is

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adjective (or perhaps a verb) more syntactic responses to unfamiliar than familiar stimuli might be expected.

Sound-alike or "clang" responses. Ervin (1961) and Entwisle, Forsyth, and Muuss (1964) have reported that the frequency of responses that sound like the stimulus (or "clang" with it) decreases from kindergarten through sixth grade. On this basis, we might expect that adults would respond with more sound-alike responses to unfamiliar words than they would to familiar ones.

The Variable of Familiarity

The basic notion being investigated in this research was that word associations change systematically depending on the amount and kind of information S has about the stimulus word, and this has been referred to with the cover-term "stimulus familiarity." In general, previous studies have manipulated the frequency of the stimulus as a measure of familiarity--assuming that a person will have knowledge about a word in proportion to the rate at which it occurs in the language as a whole. This has led to the common practice of constructing stimulus lists by referring to the Thorndike-Lorge (1944) frequency counts. While, across a large group of Ss there is undoubtedly a high correlation between the frequency of a given word in the language and its familiarity, there are several obvious problems associated with using frequency as a measure of familiarity: First, any given frequency count may or may not be representative of the relative frequencies of words in any individual's or group's experience and it is not clear that a person's knowledge of a word increases linearly (or even monotonically) with the number of exposures he has had to it. A different, more subtle problem concerns the unknown relationships of word frequencies to numerous other variables which might affect the dependent variable under investigation. For example, Cramer (1968) presents

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abundent evidence that the "emotionality" of a stimulus word has far-reaching effects on the kinds of responses obtained to it in the FWAT; and it is unknown whether infrequent words differ from frequent words in their average emotionality.

In an effort to remedy these problems, the present investigation defined familiarity in the following ways: First, it relied on frequency as an index of familiarity; however, in an effort to protect against the second sort of problem mentioned above, a list of pairs of words was constructed, with the members of each pair being roughly synonomous with each other, and with one member of the pair being considerably less frequent than the other.

As an alternative and a more direct measure of familiarity, after the FWAT was administered, each S was given a brief vocabulary test on the infrequent words to which he had just given associations. In each case he was required to pick a synonym for the infrequent word from a list of five alternatives. For each stimulus word, then, this allowed the post hoc option of separating the FWAT responses of those Ss who knew enough about the word to pass the corresponding vocabulary test item from the responses of those who failed the item. This, of course, classified each S according to whether he was or was not familiar with each stimulus word.

Method

Materials. Twenty-seven pairs of approximately synonomous adjectives were selected from The Synonym Finder (Rodale, 1961) such that one member of the pair was relatively more frequent in the language than the other. The words and their frequency ratings are given in Table 1. Two lists of words were then randomly formed from these pairs, with each list containing one member of each pair, and thus containing an equal number of frequent and infrequent words. Finally, to

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each list was added 43 filler words, mostly verbs (and not relevant to the present study); these were randomly scattered through the list. Thus, each list totaled 70 words.

Insert Table 1 about here

For each infrequent adjective in each list, a vocabulary test item was also constructed. This item was of multiple-choice format and contained five alternative words listed below the word being tested. One of the alternatives was the frequent, synonomous adjective taken from the other list. For example, for the adjective obese, the alternatives were total, complicate, angle, rhythmic, and fat. Instructions for answering these items were to select the one alternative response word which was closest to the stimulus word in meaning.

Subjects. Ss were 224 undergraduates at the University of Texas at Austin who were enrolled in an introductory psychology course. All were participating in the study to fulfill a course requirement.

Procedure. All Ss were tested in two large group sessions. Stimuli were presented in individual booklets and all responses were written in those booklets. Approximately half of the Ss in each session were given each list of stimulus materials, with 110 Ss responding to one list and 114 to the other. First, the usual FWAT instructions were given:

> "This is a free word association test. Read each word below and enter the first word that comes to mind in the space provided. Work as rapidly as possible giving a response to every item."

After he had completed the FWAT, each S was given a separate booklet containing the vocabulary items and was requested to complete these.

Classification of Responses. The FWAT responses to each of the adjective stimuli were categorized according to two different schemes, one designed to

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replicate the coding of syntactic and paradigmatic responses according to the procedure described by Deese (1962), and the other to replicate the classification procedure used by Stolz and Seitz (1971).

The classification of syntactic and paradigmatic responses following Deese (1962) involved dividing responses into those which were adjectives (paradigmatic) and those which were not adjectives (syntactic)--with unclear cases being called syntactic.

The second classification system consisted of the following categories:

(a) Logical (L). The response was an opposite, coordinate, synonym, superordinate, or subordinate of the stimulus word.

(b) Syntactic (Sy). The response was a noun which could be modified by the stimulus adjective without yielding a bizarre meaning.

(c) Miscellaneous (M). This category was made up of three subclasses as follows: M_1: A response not fitting either category above but which was meaningfully related to the stimulus word, or a response having the same stem as the stimulus but being of a different syntactic class, e.g., obese-obesity. M_2: a response which sounded similar to the stimulus. M_3: A response which appeared to be a response to a word which sounded like the stimulus, e.g., furtive-useless--probably mediated through futile.

(d) Unscored (U). A response not assignable to any of the categories above.

Results

Since this study contained two methods for defining the independent variable, word familiarity, separate analyses will be reported for each.

Familiarity defined as frequency. In these analyses the comparison is

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between the responses to the 27 frequent adjectives and the responses to their corresponding 27 relatively infrequent synonyms. Since each infrequent adjective was paired with a particular frequent adjective, dependent measures t-tests were used for all comparisions.

(a) Commonality. Stimulus commonality was measured by simply counting the number of different responses given to each stimulus word. High commonality is indicated by a small number of different responses while low commonality is associated with a relatively large number. The infrequent adjectives averaged 51.6 different response words per stimulus word while frequent adjectives had a mean of only 37.9 different responses per stimulus ($t = 3.24$, $p < .01$), thus confirming the prediction that familiar stimuli would yield higher commonality response distributions than unfamiliar stimuli.

(b) Syntactic-paradigmatic shift. In this case it was hypothesized that the infrequent words would elicit a larger proportion of syntactic (i.e., different form class) responses than the frequent words. The mean proportion of syntactic responses for the infrequent words was 0.37 while the mean proportion for frequent words was 0.32, ($t = 0.98$, n.s.).

(c) Distant-to-logical shift. Table 2 gives the mean proportions of responses in each of the Stolz-Seitz categories. Frequent

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Insert Table 2 about here

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adjectives had reliably more L responses than infrequent adjectives ($t=3.33$, $p < .01$) and tended to have more Sy responses as well ($t = 1.98$, $p < .10$). They also had fewer M responses ($t = 4.49$, $p < .001$) and fewer U responses ($t = 4.32$, $p < .001$). Within the M

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category, it was obvious that sound-alikes were used much more often in responding to infrequent words than to frequent ones. Both M_2 and M_3 responses occurred reliably more often for infrequent than for frequent stimuli ($t = 3.95$ and 4.40 respectively, $p < .001$).

Familiarity defined by vocabulary test score. Two separate response distributions were constructed for each infrequent stimulus word, one composed of the word association responses of Ss who were unable to pair the stimulus word with its frequent synonym on the vocabulary test and one composed of responses from Ss who were able to correctly answer the vocabulary item. Operationally, then, the former group was the one which was unfamiliar with the meaning of the stimulus while the latter group was familiar with it.

Since the authors did not have direct control of the relative sizes of the S groups that did and did not know each stimulus word, they arbitrarily required that, for each word, no fewer than 15 Ss be in the smaller of the two groups in order that the analyses of the response distributions be meaningful. Thirteen infrequent adjectives were dropped for this reason--in each case because too few Ss did not know them. This left 14 stimulus words as the basis for these analyses. The specific words and the numbers of Ss familiar with each are given in Table 3.

Insert Table 3 about here

(a) Commonality. An analysis for differences in commonality was not possible here, since all frequently used measures of commonality require that the response distributions being compared be of approximately the same size, or that they be much larger than the present ones.

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(b) Syntactic-paradigmatic shift. Ss who did not know the stimulus word gave an average of 64.3% syntactic responses while those who did know the stimulus gave only 43.4% ($t=3.02$, $p < .01$), thus confirming Deese's results and the present hypothesis.

(c) Distant-to-logical shift. The results according to this classification of responses are given in Table 4. Subjects who were

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Insert Table 4 about here

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were familiar with the words were more likely to give L responses than those who were not ($t=7.34$, $p < .001$). They also averaged more syntactic responses ($t=3.26$, $p < .01$) and fewer M and U responses ($t=6.09$, $p < .001$; and $t=2.73$, $p < .02$ respectively). Within the M category, sound-alikes were used substantially more among Ss who did not know the stimulus word than among those who did--the proportion of both M_2 and M_3 responses being reliably greater among the former group than among the latter ($t=3.08$, $p < .01$; $t=4.89$, $p < .001$ respectively).

Discussion

In general--with one prominent exception--the results support the hypotheses discussed in the first section of this paper. All dependent variables except the proportion of Sy responses showed differences between familiar and unfamiliar words which were analogous to previous findings for mature and immature children respectively; also, Deese's (1962) results were replicated, i.e., the frequency of same-form-class responses were found to be positively related to stimulus familiarity. However, analysis of the Stolz-

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Seitz categories showed that the proportion of "true syntactic" (Sy) responses--that is, those which could actually stand in meaningful syntactic relationships to the stimuli--increased with increasing stimulus familiarity; while it was the distant responses or those that involved physical similarity to the stimulus which were inversely related to stimulus familiarity.

This finding of a positive relationship between Sy responses and stimulus familiarity was the only unexpected result. Stolz and Seitz (1971) have hypothesized that the lexical entries for adjectives evolve through three stages as children learn them, with the middle stage--when selectional restrictions are learned--apparently yielding the highest rate of Sy responses. The present study contains little obvious evidence for this middle stage in adult word-learning to correspond to this; however, the following post-hoc analysis could be interpreted as being weakly supportive of the existence of such a stage. For the 14 infrequent adjectives listed in Table 3, the proportions of responses in each of the Stolz-Seitz categories, only for the Ss who knew the meaning of the word (i.e., who passed the vocabulary item), were compared with the corresponding proportions of responses given to that word's frequent synonym. The mean proportions are given in Table 5 and show that Ss gave more L responses to frequent words than to infrequent words with which they were familiar ($t = 4.14$, $p < .01$), fewer M responses ($t = 4.19$, $p < .01$), and fewer U responses ($t = 3.21$, $p < .01$). However, while frequent

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Insert Table 5 about here

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words had slightly more Sy responses than infrequent words, the difference did not approach statistical reliability ($t = 0.78$, n.s.). These results are

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consistent with the interpretation that even after the S knows enough about a word to match it with a more frequent synonym, he continues learning more and more about it--thus causing a continued increase in L responses and corresponding drops in M and U responses. However, Sy responses seem to stabilize in their rates of occurrence earlier in the word-learning process than do the other categories. This could be an indication that they represent information learned relatively early in a person's experience with a word. Under this interpretation, the difference between children and adults would be that Sy responses do not decline in adults as the adjectives become more and more familiar, while they do decline in children between the ages of 4 and 10. Actually, Entwisle (1966) and others have noted that the rate of syntactic responses (defined as different form-class responses) appears to be non-monotonically related to age, decreasing between ages 4 and 10 and increasing slightly after age 10. Thus, the decline in Sy responses observed by Stolz and Seitz in children may be peculiar to the relatively narrow age range from which they sampled. Also, while the decline was statistically reliable in their data, it was not nearly as strong an effect as were those involving increases in L and U responses.

An interesting and sometimes entertaining aspect of the present data involved those responses which seemed to have been retrieved through some process involving the phonological form of the stimulus. Often the physical similarity between stimulus and response was quite obvious -- e.g., diurnal-urinal, reticent-recent, gaunt-flaunt; however, M_3 responses were not uncommon, in which an additional associative step seemed to have been taken by S; e.g., gaunt-laugh (perhaps mediated through flaunt?), diurnal-bathroom, avarice-cliff. While this sort of two-step association is not usually reported in FWAT studies involving children, Entwisle's (1966) data contain numerous cases where young children

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seem to have been doing the same thing. For example, among her kindergarteners, to the stimulus deceive, responses which were probably mediated through receive were frequently given (e.g., gift, letter, give, mail, package, present, take back, etc); and in the same group, the most frequent responses to restore were food, store, and buy, in that order.

Extrapolating rather loosely from the data, the following procedure might seem plausible as a description of the strategy used by a S in producing a response to a stimulus adjective under FWAI instructions:

(a) Using the phonological form of the stimulus, search the lexicon and retrieve whatever semantic and syntactic material is available for the word.

(b) If the retrieved information includes semantic category markers (indicating what category or categories the stimulus belongs to) employ a logical strategy to search the lexicon for a contrast, coordinate, superordinate or subordinate response; or if selectional restrictions have been retrieved, use them to search the lexicon for a noun having the properties specified in the selectional restrictions.

(c) If the search in step (a) fails to yield useable material, search the lexicon for a word with a similar phonological pattern and either:

(1) Output the similar word, or

(2) Substitute the similar word for the stimulus and go to step (a).

This procedure would generally account for all response types except distant ones; however, under the assumption that the material retrieved in step (a) might be either correct or incorrect (relative to the "public" meaning of the stimulus word), distant responses could result from the above procedure as applied to incorrect lexical information.

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In summary, the present study of FWAT responses to familiar and unfamiliar adjectives in adults indicates that responses to unfamiliar adjectives pattern themselves very much like responses to common adjectives by young children, while responses to familiar adjectives -- by adults -- are, of course, similar to those given by older children. Such results are consistent with the notion that the primary cause of developmental response shifts in children is the acquisition of additional lexical material rather than the maturation of new or more sophisticated mental processes. A methodological implication is that the FWAT or some variant thereof may be a rather sensitive index of the state of one's lexical knowledge about a given word.

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Footnotes

[1] This research was performed under grant #OEG-009532163-4698 (032) from the U. S. Office of Education, Bureau of Education for the Handicapped, to the Texas Research Institute for Mental Science.

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TABLE 1

Stimulus Materials

Frequencies are in Occurrences per Million Words.

Frequent Adjective	Frequency	Infrequent Adjective	Frequency
sexy	26*	erotic	< 1
many	> 100	myriad	
stubborn	14	recalcitrant	1
neat	29	fastidious	2
happy	> 100	euphoric	< 1
pure	50-100	chaste	6
honest	50-100	candid	3
sly	11	furtive	3
quiet	50-100	reticent	1
selfish	20	egocentric	< 1
skinny	9	gaunt	6
daily	> 100	diurnal	1
angry	50-100	militant	3
strict	12	stringent	1
proud	50-100	arrogant	4
near	> 100	adjacent	9
real	> 100	genuine	19
sour	15	pungent	2
rude	36	brash	< 1
clever	33	ingenious	11
clear	> 100	transparent	10
mild	32	lenient	2

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TABLE 1 continued

Frequent Adjective	Frequency	Infrequent Adjective	Frequency
masculine	8	virile	1
big	>100	immense	29
exact	34	meticulous	1
fat	>100	obese	< 1
sharp	50-100	keen	35

*Sexy not listed separately, frequency given is for sex

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TABLE 2

Proportions of Responses in Each of the Stolz-Seitz Categories for 27 Frequent and 27 Infrequent Adjectives

Stimulus	Logical	Syntactic	Misc.			Uncored
			M_1	M_2	M_3	
Frequent	.67	.25	.05	.01	.01	.01
Infrequent	.51	.17	.05	.07	.10	.10

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TABLE 3

Fourteen Infrequent Adjectives and the Proportion of Ss Unfamiliar with Each.

Adjective	Proportion Unfamiliar
erotic	.20
myriad	.37
recalcitrant	.51
fastidious	.25
euphoric	.41
chaste	.16
candid	.13
furtive	.55
reticent	.45
egocentric	.19
gaunt	.42
diurnal	.50
militant	.27
stringent	.34

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TABLE 4

Proportions of Responses in Each of the Stolz-Seitz Categories for 14 Adjectives by Familiarity

	Logical	Syntactic	Misc.			Unscored
			M_1	M_2	M_3	
Familiar	.43	.21	.04	.08	.11	.13
Unfamiliar	.13	.11	.04	.14	.35	.22

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TABLE 5

Proportions of Responses in Each of the Stolz-Seitz Categories for 15 Adjective Pairs.

Stimulus type	Logical	Syntactic	Misc.	Unscored
Familiar and frequent	.65	.26	.07	.03
Familiar and infrequent	.43	.21	.23	.13